Shunt Resistors with Excellent Heat Dissipation

High power and excellent heat dissipation shunt resistor (metal current sensor) – PU series, 2512 (new), 3921, & 5931

Yageo shunt resistor - PU series is a perfect solution for current sensing applications with high power rating (up to 10W) requirement. The welding technology is introduced to combine the center metal alloy and copper (Cu) at the terminations together. The central open air design is the key for achieving good heat dissipation (Fig.1). The selection of metal alloy provides very low thermal EMF which can help to minimize the current sensing error.

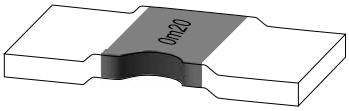


Fig. 1 *The structure of a shunt resistor. The central portion does not contact with the PCB after mounting.*

In order to better understand the effectiveness of heat dissipation in different structure designs, a temperature rising test was utilized to measure the temperature rising range under different power ratings on a 4mΩ open air shunt resistor, and one 4mΩmetal plate current sensor. The structure of a metal plate current sensor is shown in Fig.2.

The electrical characteristics of the two samples, including one shunt resistor and one metal plate

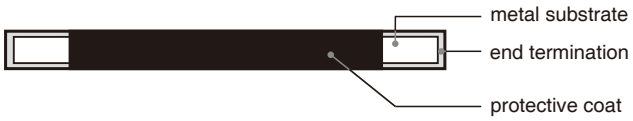


Fig. 2 *The structure of a metal plate current sensor. The whole resistor body will be in contact with the PCB after mounting due to its flat design.*

current sensor are shown in Table 1. In this experiment, a DC power supply was used to apply power to the samples from 0W to 8W which is clearly over the maximum rated power of

Sample	Series	Size	Resistance (Ω)	Power rating (W)	Tolerance (%)
1	Shunt (open air design)	2512	4mΩ	5W	±1%
2	Metal plate	2512	4mΩ	3W	±1%

Table 1 *The electrical characteristics of the shunt resistor and the metal plate current sensor which were used in the temperature rising test*

the two samples for the purposes of not only ascertaining heat dissipation capability under normal usage, but also to know the capability under overloading conditions. The experiment result is shown in Fig.3. The temperature rise of the shunt resistor was lower than the temperature rise of the metal plate current sensor. Besides comparing the temperature rise of shunt and metal plate resistors, the resistance change rate after a short time overload test was measured as well.

A 5 time's larger power rating was applied on the shunt and metal current sensors for 5 seconds. As shown in Table 2, the shunt resistor had the lower resistance change rate (-0.18%) among the two samples.

Both experiment results from the temperature rise test proved that the heat dissipation performance of the central open air design shunt resistor is better than the metal plate

current sensor. Since the shunt resistor has better heat dissipation capability, it can afford a higher power rating when compared to the metal plate resistor. Consequently for products a power rating higher than 3W, the central open air design is the best solution. This is also the reason why Yageo's high rated power metal current sensor PU series adopts this special design with a central open air structure.

Yageo provides high power (up to 10W) metal current sensor - shunt resistor PU series in sizes 2512, 3921 and 5931. The advantages of good heat dissipation, low thermal EMF, and wide operational temperature range (-65°C~275°C) are ideal for precise current sensing applications under high temperature environments such as E car battery management systems, HID (High-Intensity Discharge) headlights, ABS (Anti-lock Braking System) and ESP (Electronic Stability Program) systems and power systems etc.

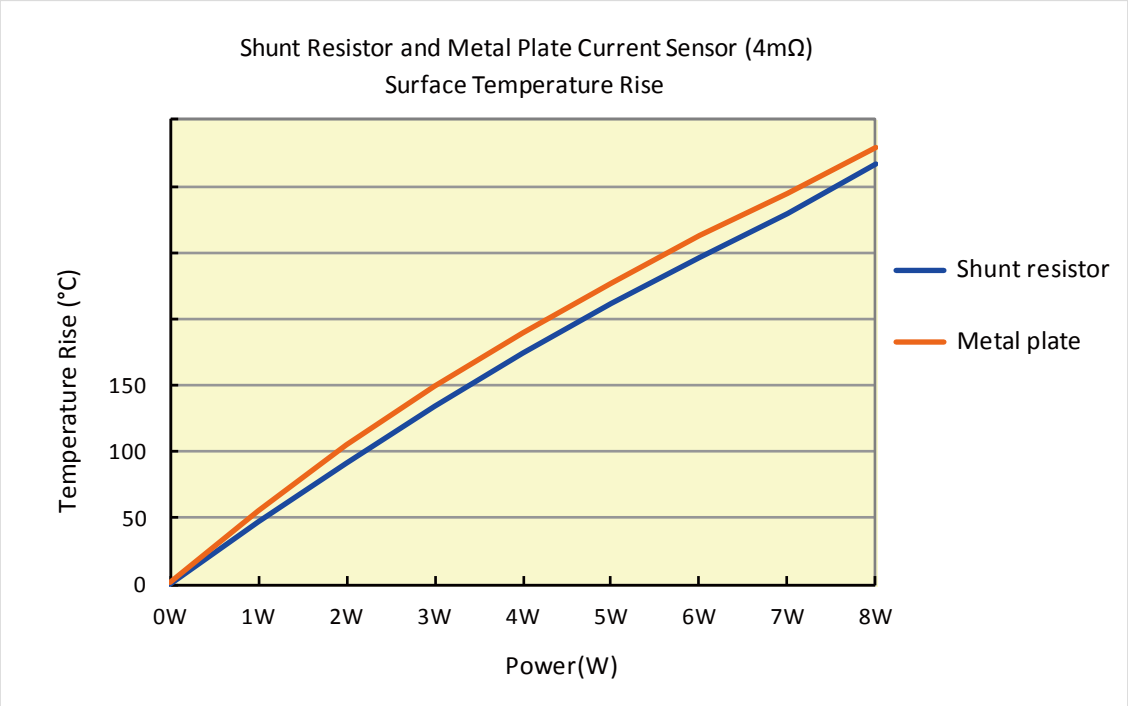


Fig. 3 *Temperature rise under different power loading on the shunt and metal plate current sensors. The shunt resistor has a lower temperature rise than metal plate current sensor.*

Short time overload test by 5 times larger rated power for 5 seconds	
Sample	Resistance change rate before and after test (ΔR/R, %)
Shunt resistor	-0.18
Metal plate	6.31

Table 2 *The resistance change rate between before and after the short time overload test. The shunt resistor showed the lower resistance change rate.*

Shunt Resistors with Excellent Heat Dissipation - PU Series

Features

- High rated power (3 ~ 10W)
- Resistance down to 0.2mR
- Sulfur resistant due to no Ag in the structure
- Low thermal EMF
- Excellent heat dissipation
- AEC-Q200 qualified

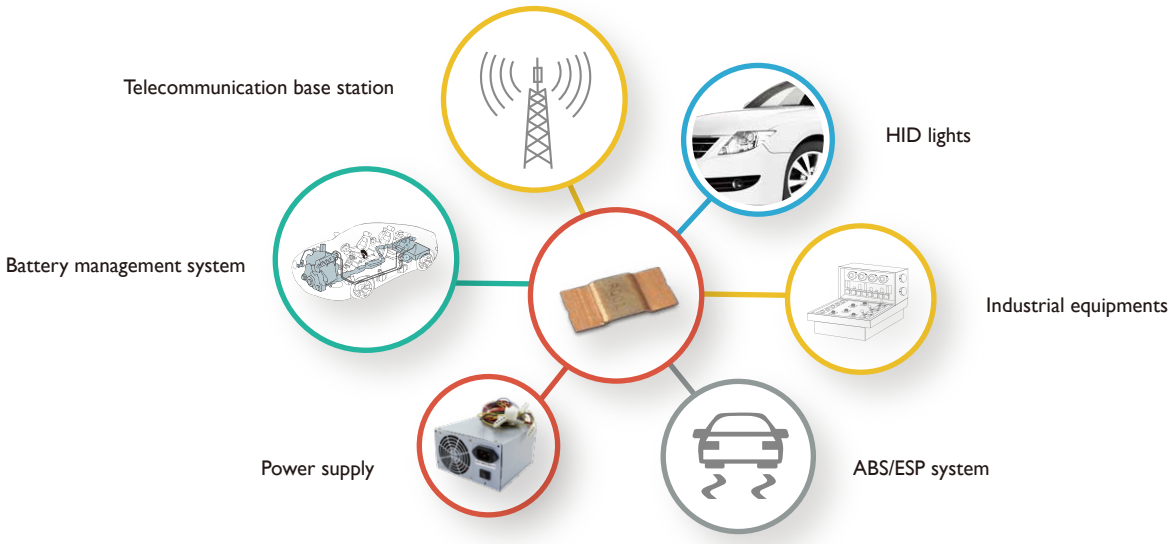
Benefits

- Open-Air design provides good heat dissipation which is able to work under high ambient temperature
- Perfect for current sensing applications with a high power rating requirement

Applications

- Power supply
- Industrial equipments
- Telecommunication base station
- HID lights
- Battery management system
- ABS/ESP system

Yageo's PU Series Application Map



About Yageo

Established in 1977, the Yageo Corporation has become the world's leading total service provider of passive components with capabilities on a global scale, including production and sales facilities in Asia, Europe and the Americas. Yageo's broad product offerings are targeting at key vertical markets, including applications for consumer electronics, computer & peripherals, industrial/ power, alternative energy, and automotive.

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